

Research article

Pluridisciplinary approaches in global postural rehabilitation

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Abstract: The global postural imbalances relationship is frequently encountered in recent medical practice, requiring multidisciplinary approaches to bring patients to function as close as possible according to the physiological limit. About half of the world's population experiences pain and dysfunction induced by postural imbalances during their lifetime. This report aimed to assess the nonpainful and curative effect of the electropuncture technique complemented by massage and active postural kinetotherapy of global posture imbalances and acute or chronic pain at various levels. This research provides an insight into the report of evidence available for the analgesic uses of TENS in postural defects. Correlations regarding imbalances at various levels were found in various studies regarding analysis or diagnosis, without addressing the non-invasive multidisciplinary treatment. In these studies, we are hoping to raise the non-invasive rehabilitation treatment and increase their use in pathologies with global postural imbalances. The discomfort and pain experienced by people with generalized postural disorder on a daily basis can have a negative impact on quality of life and, if left untreated, can lead to significant worsening of the condition over time. Global rehabilitation with non-invasive and non-pharmacological methods, without adverse effects, including electropuncture (TENS) applied to the referral points in conjunction with proprioceptive kinetotherapy techniques, massage and psychotherapy is the path to the success of occlusion-postural rehabilitation with significant results on painful suffering global postural imbalances.

Keywords: global posture, postural imbalance, correlation, rehabilitation, multidisciplinary, electropuncture

1. Introduction

The analysis of human posture and its imbalances must require a holistic view of physiology and constitution, since second- and third-degree imbalances often lead to long-term postural disorders on multiple levels, and conversely. Both variants can affect patients' quality of life and psychology. Both variants can affect patients' quality of life and psychology. Worldwide, almost half (46.7%) of the population is affected by pain and imbalances of postural pathology. In the panorama of rehabilitation, global rehabilitation aims to be of minor importance, but it often happens that in the case of cervical pain (neck), headache (headache) or dizziness, which do not find their solution by applying common rehabilitation techniques, multidisciplinary functional holistic approaches are needed, involving the study of all the levels where pain, discomfort or imbalances may occur: head, neck, shoulders, pelvis/hips, knees, or legs/soles and even psychological service. The specialized literature and the medical practice mention correlations between the dysfunctions induced by the postural imbalances. They can be solved by the myofunctional rehabilitation and physiotherapy of the entire body [1]. The human system consists of a multitude of receptors and the proprioception of the entire area must be

correlated with the proprioception of the general posture it influences. Electrical transcutan nerve stimulation is a non-invasive and extra-pharmacological method used by medical and paramedical professionals in the management of acute and chronic pain in a variety of conditions. At the same time, through the option of sedation or stimulation polarity, TENS electropuncture acts on the stimulation or relaxation of the muscles, thus offering the possibility to intervene on the cause. Relief of perceived pain aids in functional rehabilitation and restoration of physiological postural balance in static and dynamic positions.

2. Results

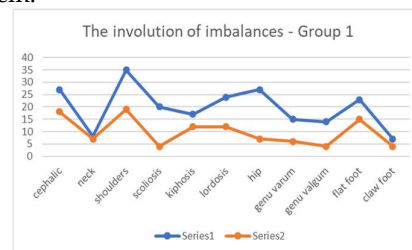
2.1. Characteristics of the patients (age, gender, environment)

Table 1. Characteristics of the patients in the study group

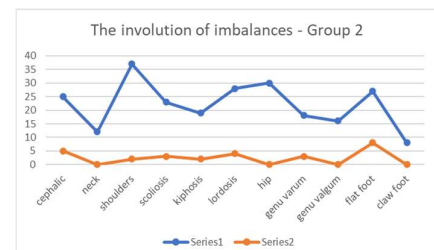
	No.	Percentage (%)	Min/Max age (years)	MD±DS
Gender (F/M)	47 women	65.28%		
	25 men	34.72%		
Age (years)			18 - 37	27.67 ± 11.32
Environment (U/R)	57 urban	79.17%		
	15 rural	20.83%		

2.2. Results obtained after using the treatment

At the end of the non-invasive treatment applied holistically for 9 months, in compliance with the medical physiotherapist's indications, Group 2 patients (who benefited from electroneurostimulation therapy and psychotherapy in addition to proprioceptive kinetotherapy and therapeutic massage) acquired mainly compared to Group 1 (to which TENS and psychotherapy were not applied) significant attenuation and even eradication of imbalances, discomfort and pain at all level, of other daily activities and even independently of them, we obtained physiological mobility angles, muscle relaxation on paravertebral and abdominal hypertonic areas, muscle toning on hypotonic areas, efficient, operational muscle strength, so that the muscles are able to support physiologically correct posture, physiological posture at the umeral, pelvis, knee level as well as plantar flatfoot rehabilitation, patients finally approaching a plantar arch at the limit of physiological values. The physiological extensibility of the nerves ensures overall and segmental physiological postures, uninterrupted postural control during daily activities for a balanced posture, thus reducing unnecessary or unbalanced muscle work. In addition to daily physical activities (work, reading, computer, piano, walking, etc.), wear comfortable shoes with a 3-4 cm heel. Patients received advice on long-term physiological postural methods, proprioception and postural control, daily use of stumps and plantar supports, and immediate pain reporting to the physician at the onset of pain, either segmental or global postural, or any other potential dysfunctions that discovered them.



(a) Series1 (initial), Series2 (final)



(b) Series1 (initial), Series2 (final)

Figure 1. The involution of imbalances: (a) Group 1; (b) Group 2

Figure 1 shows the drastic decrease in segmentar and global postural imbalances in Group 2 compared to Group 1 following the application of complete and complex treatment that includes both physical therapy and massage (which were also applied to Group 1 patients) as well as transcutaneous electroneurostimulation (TENS) and integrative psychotherapy.

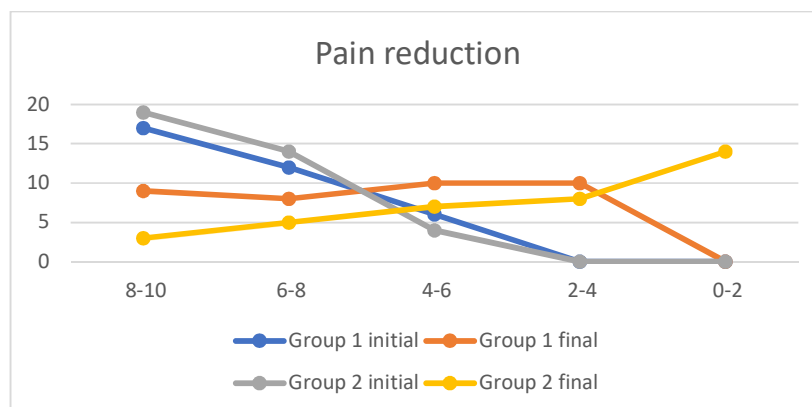


Figure 2. Pain reduction (no.of patients): Group 1 no. of patients intial/final; Group 2 initial/final

We see a significant increase in the number of Group 2 patients experiencing significant pain reduction at all levels (segmenta, global) falling within the pain threshold of 2-4 or even 0-2. After application of the treatment, the majority of patients in Group 2 experienced a significant reduction in pain levels compared to Group 1, as evidenced by an increase in functionality, general well-being and self-confidence, resulting in a significant improvement in the quality of treatment improve. It is important for society, family, and themselves to reintegrate these patients into productive daily activities, family, and social life in order to regain self-confidence and stimulate self-awareness, commitment, and awareness of self-boundaries.

3. Discussion

In the rehabilitation clinic, patients are diagnosed with postural disorders affecting different levels - head and limbs, neck, shoulders, pelvis, hips, lower limbs (knees, ankles, soles of feet) - and even some patients with a history of chronic development who have registered Unbalanced overall posture, which affects all listed levels, as shown in the findings chapter. Within the niche of global postural rehabilitation approaches, the literature on relative effects and different levels of segmental postural effects is weak and incomplete. The professional literature views the topic separately from the perspectives of diagnosis, symptoms, manifestations or treatment in postural rehabilitation, whereas combined treatment is not relevant. However, segmented treatment approaches (which we usually find in professional literature) document immediate or short-term effects and results, but in the long term, systemic postural disorder will persist or even worsen and become chronic, which is more difficult to resolve and treatment, thereby reducing the actual chance of overall postural recovery. Rehabilitation treatment must target the cause of the disease and effectively intervene in side effects to avoid recurrence, pain and functional impairment. People facing postural disorders, especially young and active people, can benefit greatly from long-term maintenance treatment. This includes permanent postural control, daily maintenance exercises, and regular treatment of new imbalances and dysfunctions. In this way, these individuals can relieve the physical and mental stress caused by functional limitations and discomfort.

By taking all preventive and anticipatory measures, as well as the correct treatment, regarding the dysfunction, its causes that maintain and aggravate it, and the timing of its onset, satisfactory results can be achieved in terms of integrity and health of the affected population. Postural homeostasis is achieved thanks to the memory of the neural network, which stores a reference model of all basic and derived positions through the relevant

information received from the receptors. This means comparing the required pose model in the neural network of the existing model to the required pose model at each time point.

Correct posture is especially important when performing movements. The characteristics of strength and resistance, speed and athleticism cannot be fully realized if we do not ensure the most correct posture of the body. Keeping up the proper state of mind in development requires the commitment of dynamic components (muscles and nerves) and so performs with full vitality utilization. Adjusting the body and planning developments it requires complex and impeccably adjusted strong activities.

Influencing the verticality of the body causes unsettling influences within the typical alignment (postural awkward nature). The idea of muscle adjustment takes into consideration the idea of muscle action concurrent utilization of agonist and antagonist muscles. Muscle lopsidedness can be initiated by a locomotor framework harm or, on the opposite, may be the cause of an harm. Muscle awkward nature are capable for the appearance dysfunctions and wounds and is introduced as a result of overstraining the agonist muscles within the burden of the adversary.

The idea of muscle awkwardness as an adjustment to clarify a huge number of pathologies related to the worldwide postural awkward nature. Postural control implies the coordination of the whole framework of substantial forms particular that are dependable for postural adaptation during motor behavior. Pose may be a neuro-mechanical (neuromuscular) response with the point of keeping up adjustment the body. A body is in harmony when the entirety of all the powers acting on it is zero. The soundness of a body alludes to the reality that, by aggravating its balance, it has the capacity to return to the harmony position without falling. The pose in this manner keeps up the adjustment and body stability.

Keeping the body in a straight, adjusted position is really the most objective of postural control in people. Lasting control of posture could be a characteristic of a solid anxious framework, permitting soundness and the start of the required developments. Any unsettling influence in adjustment, in control posturally, it genuinely changes the viable effectiveness of our activities. *Psychiatric approach.* Patients with chronic back pain are affected both mentally and somatically. A mental pain can accentuate the dorsalgia and vice versa, a dorsalgia can cause an influenced mental state. For this reason, dorsalgia in patients with mental disorders, especially depression, is indicated to be treated in a very short time so as not to decompensate the already precarious mental state of these patients. Depressed patients need daily mobilization and are dependent on postural health. Social isolation and the inability to mobilize physically aggravate their psychoemotional state [3]. Some psychiatric medications like Gabapentin and Duloxetine impact and resolve chronic pain. This medication is often used in patients with corneal osteomuscular disease [4]. The mechanism of action of gabapentin is due to its effect on calcium channels located in the peripheral nervous system and central nervous system. They alter the release of neurotransmitters and thereby reduce the excitability of nerve cells. This mode of action of gabapentin has antiepileptic, analgesic, sedative and mood stabilizing effects [4]. A significant number of patients with neuropathic pain are disabled with moderate or severe pain for many years. Conditions caused by chronic pain fell into five of the 11 conditions that define years lived with disability and a decline in quality of life [5]. In addition, this leads them to the inability to perform their professional activity well, in some cases even with the loss of jobs and with a major impact on medical insurance that suffers from chronic treatments, repeated hospitalizations and sick days. Duloxetine also has an analgesic effect, particularly at a dose of 60 mg/day in patients with chronic pain, and is well tolerated by patients [6]. These treatments have psychiatric, neurological and other specialties depending on the psychic and somatic profile of each patient. Chronic postural pain (dorsalgia) must be treated multidisciplinary, so pain relief will occur faster and other medical conditions such as psychiatric or neurological conditions can be detected early.

4. Materials and Methods

This article describes a 12-month pilot study conducted at the Domenico Medical Center of Iasi, from January 1 to December 31, 2019. It involved 72 patients with diagnoses of segmentar and global postural imbalances.

The seventy-two patients extended in age from 18 to 37 a long time, came to the rehabilitation center denouncing imperative torment and useful weakness at different levels: cervical, thoracic, lumbar, knee, soles or indeed worldwide postural lacks. Patients gotten clinical interview, postural segmentar and worldwide, counting plantar assessment with the assistance of the posturograph getting diagnostics of segmentar or worldwide postural lopsided characteristics - at the level of the cephalic limit, of the neck, touching the chest and lower appendages - like kyphosis, scoliosis, genu varum, genu valgum, level foot or claw foot, as the case. The inclusion criteria: patients diagnosed with related segmentar or global postural imbalances like kyphosis, scoliosis, genu varum, genu valgum, flat foot or claw foot.

The exclusion criteria: patients without indiscriminate and/or non-cooperative.

All people gave their informed consent prior to their inclusion in the study and agreed for the study to be published. The study was approved by IRB no.7 of 17.10.2017.

The 72 patients were divided into 2 Groups, one having 36 patients (Group 1) and the moment bunch having 36 patients (Group 2). Group 1 gotten as it were segmentar recovery treatment comprising of regular physical treatment and knead. Group 2 gotten a total postural recovery treatment comprising of proprioceptive kinetotherapy, restorative knead supplemented with transcutaneous electrical neurostimulation (TENS) to diminish torment level and encourage mobilization and mental counseling.

Postural awkward nature of the cephalic limit, neck, spine, utilitarian lacks of the thoracic, lower appendages or arching/platfus of the soles, confinements of head development in flexion/extension and turn, all this actuating constraining autoperceptions, stretch, self preoccupation, uneasiness, depression and lacks in patients communication with restorative staff were moreover watched. The patients underwent posture rehabilitation treatment, following punctually, in stages and simultaneously each of the deficiencies found during the postural evaluation performed with the posturograph provided by the center. Postural evaluation was performed both clinically (lead wire, goniometer, flexible meter, etc.) and evaluation at a posturograph equipped with podoscope.

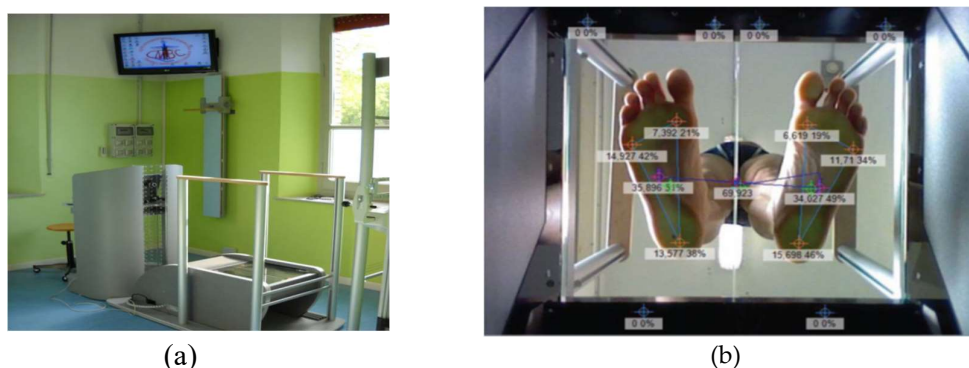


Figure 3. (a) Posturographer 01599-Podata, Chinesport S.P.A. Italy, 2010, (b) Podoscopy

The initial postural evaluation revealed imbalances of alignment of the cephalic extremity, extraphysiological curvatures at cervical, thoracic, lumbar level, postural imbalances at the level of bilateral symmetry of the shoulders and pelvic assembly, but also at the level of the coxal joints, knees, ankles and soles. With the entry into recovery treatment, a hypotonic, hypotrophic, hypokinetic, poorly represented muscle mass with marked tonicity deficiency could be observed and found in all patients included in the study, both those in Group 1 and Group 2, local muscle contractures being present in areas affected by imbalances: cervical, thoracic, lumbar, lower limbs, foot, as appropriate. At the

same time, was found out tonicity postural lopsided characteristics, most likely initiated by insufficient, uneven tonicity of the muscles and the nearness of torment multilevels, actuating utilitarian lopsided characteristics. Group 2 patients were alluded to a brain research office, where they gotten fitting mental directing on push, self-perception, contemplation, uneasiness, misery and the patient's relationship with individuals in immediate interaction. It turned out that patients were mostly mindful of pose and interaction lacks but fizzled to act practically on them, encountering a negative conclusion of need of self-confidence.

Both bunches, Group 1 and Group 2 gotten physical treatment treatment consisting in reeducation of segmental, zonal, common proprioceptive kinesiotherapy, therapeutic knead, respiratory kinetotherapy, dynamic kinetotherapy particular to expanding muscle tone and quality, dynamic kinetotherapy to re-educate coordination, equilibrium in postural control and adjust, particular methods for re-education of affectability and postural proprioception. In the application of all applied techniques and methods, the mirror was used for self-knowledge and postural self-perception, massage, active kinesiotherapy to stimulate proprioception, respiratory kinesiotherapy.

Group 2 gotten an extra transcutaneous electrical neurostimulation applications in regular sessions, 30 session, for 60 days, and concomitant 10 sessions of psychotherapy. The electrical transcutaneous neurostimulation strategy could be a noninvasive and extra-pharmacology elective. TENS applications have signs in torment help and the hyperactivity of the muscle. Transcutaneous electric nerve stimulation can prompt or inhibit the pastime of nociceptive neurons within the significant fearful system, relying on their polarity. Pain is relieved via way of means of growing the amplitude of the TENS pulse to generate a painless paresthesia beneath the electrodes [7]. Neuromuscular electrostimulation produces the stimulation of muscle contractions, bringing the muscles to the state of physiological functioning. Similarly, the sedation function (polarity change) induces relaxation in the contracted muscles. These two effects, acting synergistically, balance imbalances in muscle tone [8,9].

The patients were educating to utilize plantar underpins amid their everyday exercises and within the non-invasive medicines connected particular physiotherapy was presented for plantar recuperation, either in terms of the re-education of cases of flatfoot or over-arching of the sole. The inclusion of plantar underpins within the day-by-day exercises of patients with worldwide postural lacks is a dependable strategy, which does not come up short, these plantar bolsters adjusting the postural shortfall, guaranteeing the adjust of the posture both in orthostatism (settled position) and within the flow of exercises [10,11].

The segmental posture is able to interfere with cervical paravertebral muscle activity through fascial, muscular and nerve connections

These muscle connections should not make us think of pure mechanical adjustments, but of integrated neuromuscular adjustments, being obvious that the dialogue between muscles for postural regulation does not happen directly in one muscle structure or another, but is transmitted through nerves, with proprioceptive involvements.

Consequently, the spatial position of the cephalic extremity actively participates in the stabilization of the skull on the spine, and, further, in the neuromuscular activity balance, being an integral part of the global postural system [12,13].

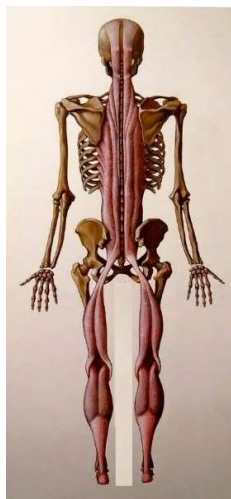


Figure 4. Posture support backside muscles [4]

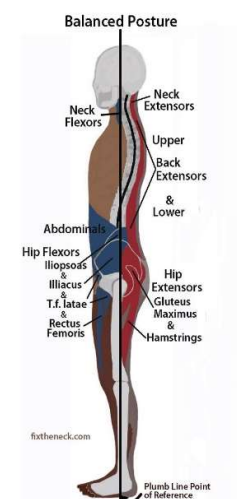


Figure 5. Balanced posture flexors/extensors [8]

In this study Pointoselect Digital DT device (Figure 4) was used. The device allows a usage of the probe to accurately detect a stimulation point automatically. After the exact area of the stimulation point, the same test is utilized to transmit the electrical current, with a run of doable alternatives accessible: Bahr or Nogier frequencies, or other frequencies. The specialized details of the gadget are working frequency range: 2 – 128 Hz, impulse duration: 60 – 120 μ s, intensity: 28 mA, power supply: 9 V.



Figure 4. Pointoselect Digital DT device, Pierenkemper GmbH, Germany, 2014

Electroporation can intervene by intensification, diffusion, and transfer as needed. Conditioning means increasing, stimulating and strengthening the activity of nerves and muscles. Dispersion is explained by decreases, attenuation, sedation, and bursts of neuromuscular activity. This transfer is reflected in the electromassage of the nerves and implicitly the muscles innervated by the corresponding nerve pathways and results in an acceleration of the energy flow during strengthening or a slowing down of the energy flow during dispersion.

Use frequencies below 5 Hz for a tonic effect and above 20 Hz for a calming effect. Stimulation frequency is 1-3 Hz for 3-5 seconds, pause for 3-5 seconds to achieve tonic effect (or continuous, conventional 0.5-10 Hz), 50-250 Hz for 0.3-0.5 seconds, pause for 4-5 seconds. It takes 5 seconds to achieve a calming effect.

The applied current intensity is up to 1mA and the voltage is up to 100V, depending on the electrical impedance of the skin. The electrode polarity "+" positive electrode is used for dispersion, and "-" negative electrode is used for color adjustment.

This is a scientific rehabilitation pilot study take a look at, constituting itself to be a initial check aiming to evaluate the feasibility thereof and to pick out any capacity troubles and factors earlier than carrying out a much wider take a look at at the physio therapeutic

noninvasive remedy used withinside the postural rehabilitation corroborated with self-perception psychotherapy. For this research, the statistic analysis was carried out by using Microsoft Office Excel 2021 version.

A search of the PubMed/Medline electronic database was performed for dates up to March 2024. The search terms used included “global posture”, “postural imbalances”, “diagnosis” or “non-surgical management” or “conservative management” or “drug treatment” or “behavioral therapy” or “physical therapy”. Further research had been selected on the idea of guide searches of reference lists and evaluate papers and from conferences of the National Institutes of Health (NIH), or Royal Australian College of General Practitioners (RACGP). Some guiding principle agencies had been additionally looked for current exercise recommendations and systematic critiques on analysis and non-surgical control of global posture causal relation.

5. Conclusions

Any postural imbalances will generate in time discomfort both physically and mentally, will considerably diminish the quality of life, being the source of the development of other future pathologies. Incorrect posture will lead to imbalances of the musculoskeletal system on multiple levels, will hinder the respiratory process, will diminish the exercise of cardio-vascular functions, will induce digestive discomfort, increases the pressure exerted on the spine thus hastening its degeneration, induces headaches, neck, shoulder and back pain, reduces flexibility and damages joints, affects body balance increasing the risk of injury, increases stress and fatigue levels. All of these, each or together, leading to introversion, anxiety or even depression, withdrawal from social life and even social exclusion. Postural analysis involves static and dynamic analysis, the two being intertwined. The defining structure of a balanced functional posture is given by the spine with its three physiological curvatures: cervical, thoracic, lumbar. Proper posture keeps these curves in the neutral position, without interfering with physiologically functional angles. The multidisciplinary collaboration regarding both diagnosis and treatment has an effect and proves its effectiveness in the context of the existence of global postural imbalances. The increased incidence and prevalence of global postural imbalances induced by daily static professional, family, recreational activities requires opting for holistic and multidisciplinary integrative treatments.

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Informed Consent Statement: Informed consent was received from all subjects involved in the study. The patient(s) has(have) given their written informed consent for this paper to be published.

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